Urban Roads Bridges & Flood Control

城市道桥与防洪

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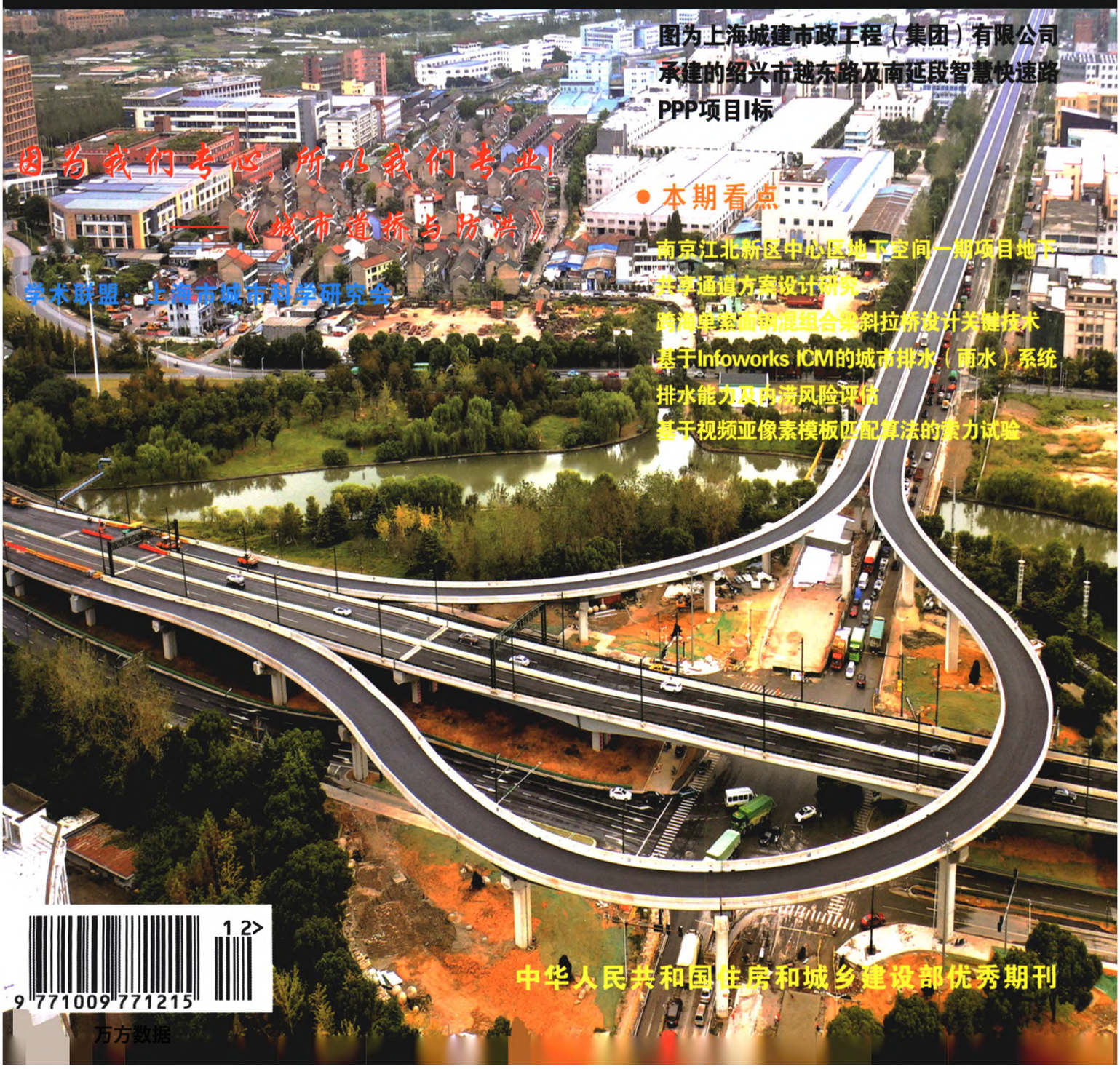

图为上海城建市政工程（集团）有限公司承建的绍兴市越东路及南延段智慧快速路PPP项目I标

因为我们专心，所以我们专业！
——《城市道桥与防洪》

学术联盟：上海市城市科学研究会

● 本期看点

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广告索引

封面工程

本期封面工程为绍兴市越东路及南延段智慧快速路 PPP 项目，由上海城建市政工程(集团)有限公司承建 I 标。I 标工程北起杭甬高速，沿中兴大道、三江路、越东路向南至越东路凤林路交叉口，工程范围内快速路主线总长约 9.2 km。道路断面形式为“主线高架 + 地面辅路”。中兴大道主线高架标准段采用双向 4 车道，三江路主线高架标准段采用双向 4 车道，越东路主线高架标准段采用双向 6 车道，地面辅道标准段采用双向 6 车道，工程总造价约 23.97 亿元。

该工程为杭州亚运会重点配套项目，是绍兴市第一条智慧快速路，也是绍兴市“六横六纵”快速路网的重要组成部分。项目实施标准化设计、工厂化制造、装配式施工、信息化管理的建设方法，分别采用了预制构件、大悬臂盖梁两节段“反拉法”施工、液压自平衡吊具、现浇盖梁无落地支架、改性聚氨酯混凝土、预制空心立柱、钢与混凝土组合结构应用、大跨径超重钢箱梁提升、超高性能混凝土 UHPC 等多种创新性工程技术；通过融合 BIM 技术、5G 现代通信网络、智能芯片等，实现网联车测试系统、智慧云控制平台等先进功能；采用先进的智慧交通管理技术，实现无人驾驶，全面打造“智能、快速、绿色、安全”的智慧快速路。

项目于 2018 年 12 月 8 日开工，其中中兴大道主线高架和中兴大道地面道路已于 2021 年实现通车。

Urban Roads, Bridges & Flood Control

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CONTENTS

ROADS & COMMUNICATION

Abstract: With the construction and development of urban core business districts (CBD) in China, how to rationally allocate the vacant parking spaces in various garages and maximize the utilization of parking resources is an urgent problem to solve. In the study on the design of Nanjing Jiangbei New District Central Area Underground Space Phase I Project, a circular shared passage for the underground cars is designed, and the underground parking resources are connected and integrated in order to improve the service efficiency of the garage. At the same time, the entrances and exits connected to the municipal roads are used to quickly divert some car traffic entering and exiting the underground garage, thereby reducing the road traffic pressure on the ground and improving the traffic service quality of CBD. Two design schemes of "one-ring two-connection" ring scheme and "one-line six-connection" tree-shaped scheme are proposed, and compared and analyzed from the aspects of traffic function, connected land number, garage sharing engineering, implementation process and engineering cost. The analysis result shows that the "one-ring two-connection" ring scheme can more effectively connect and integrate the underground parking resource in the area and improve the service efficiency of garage.

Keywords: underground space, underground shared passage, scheme design

Abstract: Wenming Avenue Expressway in Ganzhou City of Jiangxi Province is an important horizontal part in the "one-ring", four-horizontal" and "six-vertical" expressway network system of the central urban area in Ganzhou, which is in the east - west trend. Its total length is about 6.48 km. It is mainly the elevated bridge including the elevated road and ground road, and spans Zhangjiang River and Beijing - Ckowlonn Railway with an interchange. Aiming at the problems of expressway passing through the core area of old city, large construction scale, complex engineering and limited red-line land, combined with the main control conditions, the main technical standards and overall design scheme are determined. The overall layout, important node comparison and plane - vertical - horizontal design of the expressway are special introduced, which provides the reference for the similar expressway projects.

Keywords: expressway, old urban area, overall design, cross-section layout, elevated bridge

Abstract: Jinjianhuang Expressway is an important part of the "nine-horizontal six-vertical" expressway network in the eastern new area of Chengdu. Its north extension section is the controlling project of this expressway. Aiming at the difficulties of more control nodes, complex engineering design and high

BRIDGES & STRUCTURES

Abstract: Shawan Road Overaa Bridge is an iconic landscape bridge in Yichang City Baiyang Port Logistics Park. It spans Baiyang Avenue. Its total length is 249.5 m. Its main bridge is a 2 × 74 m single-plane cable-stayed bridge with a horizontal herringbone pylon and the asymmetrical one-sided arrangement. The main pylon and main beams are made of steel structure. The bridge deck pavement is casted of pouring asphalt concrete.

Keywords: landscape bridge, cable-stayed bridge, single-plane, herringbone pylon, steel pylon, steel box beam, pouring asphalt

Abstract: Based on a rapid project in Shanghai, under the boundary constraint condition, the thin beam structure is used to widen the existing bridges in order to meet the needs of bridge mechanics and function, which provides an efficient solution for complexly widening bridges.

Keywords: widening bridge, thin beam, scheme design

Abstract: Ankang City is built along the Han River. The surrounding buildings of the bridge have the important historical and cultural significance. Both sides of the bridge are connected to the important streets and railway station of Anking City. The key research topics are the location direction of the landscape bridge, the integrating degree of the bridge type selection with the surrounding historical culture, and the connection of the landscape bridge with the roads at the both sides of Hanjiang River. The design scheme of Hanjiang River Landscape Bridge in Ankang City is studied from the aspects of design idea, functional positioning, bridge location comparison, bridge type schemes and cost.

Keywords: pedestrian landscape bridge, traffic connection, functional positioning, cable-stayed bridge, slow traffic system.

Abstract: The long cantilever glass suspension covered bridge with its novel shape has become the highlight of scenic spots to attract tourists. Taking the glass suspension covered bridge in Tonglu Chuiyun Tongtianhe Scenic Spot as an example, the structural stress of the bridge shows the complex spatial mechanical characteristics. In order to understand the stress characteristics of the bridge in detail, Midas/Civil is used to analyze its stress performance. By stress analysis, the overall stress performance of the bridge is good.

Keywords: long cantilever, suspension covered bridge, stress performance

Abstract: A rigid-frame bridge is widely used in crossing the existing roads because of its unique structural characteristics. Taking a new railway as the engineering background, according to the engineering situation of the site, the rigid-frame bridge with the different spans, clear height and skew angle is designed. Based on MIDAS plate element, the model is established to analyze the mechanical characteristics of the rigid-frame bridge, and then the reinforcement calculation is carried out to obtain more reasonable reinforcement calculation results, which can provide reference for the similar projects.

Keywords: rigid-frame bridge, span, clear height, skew angle, finite element model, mechanical characteristics, reinforcement calculation.

Abstract: In order to study the seismic response performance of the viaduct in front of the airport station according to American code, the influence of the bridge substructure is analyzed to guide the design of the viaduct. Taking a viaduct of a Southeast Asia airport as the study object, the model is established by using the finite element software to analyze the influence of its unconventional pier-column size on the seismic response of the overall bridge structure, and to check the ductile seismic design of the bridge. The results show that the variable section cylindrical piers with large top and small bottom are adopted, and the main beam adopts an integral box girder with a width of 32.8 m. Through the check of control section, it is shown that the pier bottom is the weaker section. The content can provide reference for the seismic engineering of other similar bridges.

Keywords: airport viaduct, bridge code of America, Anti-seismic

Abstract: Based on the engineering background of Zhanlan Avenue Bridge (Zhanyun Bridge) crossing river in Shenzhen Airport New Town Start-up Area Integration Project, the design ideas, problems and solutions in the whole process of bridge design and construction are briefly discussed, and how to use BIM technology to solve various problems met in scheme design, construction drawing design, factory processing and on-site installation is expounded. The design ides of landscape bridge and the application experience of BIM in design and construction are mainly introduced, which can provide some reference for the design and construction of other similar bridges in the future.

Keywords: BIM, steel structure, steel bridge, beam-arch composite bridge, bowstring arch bridge, Zhanyun Bridge

Abstract: In order to meet the traffic requirements of the crowd after the reconstruction of riverside landscape, two landscape arch bridges are designed in the Nixi River and the adjacent wetland area. When the relevant parameters of the arch bridge are preliminarily determined, the time to determine the final scheme is shortened by sorting and analyzing the design parameters of the existing projects. The design analysis process of the project has a certain reference value for other similar projects.

Keywords: landscape, parameter, design

FLOOD CONTROL & DRAINAGE

Abstract: In order to evaluate the drainage capacity and waterlogging risk of drainage (rainwater) system in LSH basin, a hydrodynamic model of drainage (rainwater) system in LSH basin is built based on Infoworks ICM. The drainage capacity and waterlogging risk of the current drainage (rainwater) system are evaluated, and the corresponding reconstruction scheme is proposed for an important region according to the evaluation result. And then the reconstruction scheme is simulated and verified through the model. The results show that the standard rate of drainage (rainwater) pipe network in LSH basin (meeting once every two years) is 68.4%. The rate of reaching the standard of

Abstract: In recent years, the large-scale urban construction has had a great negative impact on the ecological environment. In order to solve the problems of environmental pollution, water resource loss and ecological degradation, it is necessary to strengthen the construction of sponge city facilities in the road design. By analyzing and studying the typical measures of sponge cities such as the permeable paving, sunken green space, biological retention and grass-planting ditch, combined with the actual road engineering applications, the runoff control accounting methods are proposed, and a series of safe, effective, economical and applicable road sponge measures are summarized.

Keywords: sponge city, typical approach, sunken green space, runoff control

Abstract: Taking the foundation pit drainage of construction site in the south of Hexi in Jianye District, Nanjing as a study object, the present situation of foundation pit drainage and its influence on the water environment are analyzed. From the perspectives of formulating the group discharge standards, introducing the water governance agency, strengthening the drainage treatment monitoring and supervision, and building the intelligent construction sites, the pollution prevention and control countermeasures of foundation pit drainage are formulated, and the scientific and reasonable foundation pit drainage management model is explored, which provide the reference for the foundation pit drainage management in other similar areas.

Keywords: foundation pit drainage, groundwater, discharge standards, intelligent construction site

Abstract: Zhangye has an ancient reputation of "half a city reed half a city tower, a lake with flowers racing Jiangnan". Surrounded by a moat and connected by ponds and ponds, it is clear that its rich water system has created a good urban water ecology and wetland landscape. However, with the rapid development of the city, the water ecological environment in the urban area has been destroyed to a certain extent, especially in the southeast of the city. The present water system is mostly blocked by urban construction, and the water ecological environment is relatively fragile. Based on the analysis of the present situation and the study of the overall planning of Zhangye, the planning ideas of using the agricultural drainage of irrigation canal as the water source and constructing the water system around the city along the Third Ring Road are proposed. And through five strategies of the "ecological meltwater, dam retaining water, excavating catchment, scientific green water and waterways connection", the planning vision of "water moistening Zhangye, cultural city" is finally realized. Its effect can provide the reference for the water system planning of the other cities.

Keywords: urban area of Zhangye, water ecology, planning objective, planning idea, planning strategy

MANAGEMENT & CONSTRUCITON

Abstract: A landscape bridge in Exhibition Avenue of Shenzhen Airport New City is a new type of landscape steel bridge structure. Because of its unique shape, the stability of arch rib is poor before the structural system transformation. The common construction methods of "arch before beam" or "beam before arch" can not solve the contradiction between the construction safety and economy. Therefore, on the basis of the above two methods, this paper attempts to use the structural characteristics of the main

Abstract: There is no similar engineering experience for the safety detection of high-pole lamp structure in the industry. In the case of essentially blank in the existing methods, the basic condition survey, technical condition inspection, loading test, tilt monitoring and rating classification of the high-pole lamp are expounded and analyzed respectively and the safety detection and evaluation method of high-pole lamp structure are summarized and formed, which provide some reference for carrying out eh similar engineering detection projects in the industry in the future.

Keywords: high-pole lamp, lamp panel, jacking system, detection

Abstract: There are 439 sets of broken bolts and 16 073 sets of seriously corroded bolts on a bolted steel box girder with a main span of 618 m. The fracture reasons are analyzed from the aspects of initial material defects, processing technology, stress corrosion, mechanical properties and fatigue fracture by using the methods of disease investigation, metallographic analysis, chemical component analysis and finite element analysis. The results show that the bridge deck water seeps into the box girder from the connection joint at the pavement damage. The caused stress corrosion is the main reason to cause the fracture of the high-strength bolt of the bridge. Based on the analysis, the bolts with serious corrosion and fracture have to be replaced, and the seepage point is blocked, and the corrosion and fracture of high-strength bolt will be obviously reduced.

Keywords: cable-stayed bridge, bolting steel-box girder, high-strength bolt, corrosion, fracture

STUDY ON SCIENCE & TECHNOLOGY

Abstract: Aiming at the cable force test of cable structure and based on the laboratory test, the computer vision method and the traditional acceleration sensor method are compared, and the applicability of computer vision method is discussed. It is studied the use of the servo static load anchor testing machine to tension a single steel stay-cable strand. The simulation of cable tensioning stress state is simplified. The dynamic response of cable is measured by the non-contact measuring method of camera photography. The dynamic deformation, base frequency and force of cable are identified by the sub-pixel template matching algorithm, and are compared with the test results of the traditional acceleration sensor. The study results show that the rumble spectrum peaks of cable identified by the computer vision method are obvious, and the identifying result of base frequency is basically same as the test result of acceleration sensor. The maximum error between the cable force identification result and the measured value is less than 6%, which has the ability to conduct the actual structural cable force test.

Keywords: cable force, non-contact measurement, computer vision, template matching, laboratory test

Abstract: In view of the uncertainty of prestress loss and its support effect risk evolution of anchor cable support system caused by the construction disturbance of deep foundation pit in soft soil stratum, combined with the large deep foundation pit project of Wenzhou Airport, the in-situ test is carried out on the distribution characteristics and evolution of soil anchor cable prestress in the whole process of foundation pit excavation. Based on the real-time data, the variation characteristics of anchoring force in the process of foundation pit excavation, the influences of construction methods and parameters on the

stability of the asphalt can ensure the serious rut disease not occurring within the service life of asphalt pavement. In order to explore the high temperature viscoelasticity of asphalt, three matrix asphalts and two modified asphalt are selected. The dynamic shear rheometer (DSR) is used to test its high temperature performance. The consistency of softening points, PG high temperature grading results and multiple stress creep recovery (MSCR) test results of different asphalts is compared. The result shows that the results obtained by using the different experiments have the consistency. The high temperature performance of the modified asphalt is better than the matrix asphalt. The softening point, rutting factor ($G^*/\sin\delta$), and creep recovery percent (R) of modified asphalt are higher than the matrix asphalt, and the non-recoverable creep compliance (Jnr) are lower than the matrix asphalt. Additionally, the test index based on DSR can better express the viscoelasticity property of the asphalt by comparing with the needle penetration and softening point, and can better simulate the rutting development process on the practical pavement.
Keywords: asphalt cement, PG high temperature grade, rutting factor, multiple stress creep recovery (MSCR) test

Abstract: In order to dispose the slag produced by tunnel excavation, and to solve the problems of insufficient supply of and demand for the natural sand and high cot in the construction of mountain road, the tunnel slag from a tunnel excavation in Chi-qi Expressway is taken as the raw material to prepare the machine-made sand used into concrete. The influences of the stone powder content, grading, grain shape feature, MB value and other characters of the machine-made sand on the concrete slump are studied. The test results show that the slump of machine-made sand concrete increases first with the increase of stone powder content, and then decreases gradually when the content exceeds 5.4%. Among the three gradations listed, JP2 with the particle contents greater than 1.18 mm and less than 0.075 mm contribute greatly to the slump of machine-made sand concrete. The particle characteristics of machine-made sand have good linear correlation with slump. The larger the Mb value of machine-made sand is, the smaller the slump of concrete will be. The Mb value of machine-made sand should be controlled during production.
Keywords: machine-made sand, stone powder content, grading, characters of sand, methylene blue value

Abstract: The reasonable design theory and practical design calculation method have not been formed in the engineering application of mini-type steel pipe pile, and the design mostly relies on engineering analogy. Based on the equivalent method, the mini-type steel pipe composite anti-slide pile group and the rock-soil body are taken as a flexible anti-slide retaining wall. The general design steps of the mini-type steel pipe composite anti-slide pile are introduced, and combined with a project, the design calculation method of the mini-type steel pipe composite anti-slide pile is studied, which provides a reference for solving the similar engineering problems.
Keywords: mini-type steel pipe pile, equivalent method, computing method

APPLICATION OF ACHIEVEMENTS

Abstract: The traditional sense of surveying and mapping has been unable to meet the needs of the information age of intelligent surveying and mapping. The unmanned aerial vehicle (UAV) oblique

THE RELATIVE SPECIALITIES

Abstract: The settlement plan is the plan and planning in advance for the project settlements. The settlement management philosophy is implemented in the whole process of project through the effective plan. Taking a municipal project as an object, the contents especially for attention in the settlement plan of EPC are analyzed to improve the management level of settlement.

Keywords: EPC (engineering, procurement and construction), EPC settlement, plan

Abstract: Aiming at the problem of the municipal engineering cost index in Shenzhen City higher than the cost indexes in the main cities of Guangdong Province, combined with four ongoing projects of Shenzhen New City Interchange, Sili Road Reconstruction, Tonggang Avenue in Shenzhen-Shantou Cooperation Area and Shenzhen-Shantou Avenue, the main factors of cost different are analyzed from four aspects of labor cost, material expenses, quota level and local valuation.

Keywords: municipal engineering, analysis of cost difference

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